ATTACHMENT H

WRITING STATION DESCRIPTIONS AND RECOVERY NOTES WITH WDDPROC

Descriptions are one of the end products of surveying, along with the positions and the survey marks themselves. All three shall be of highest quality. The descriptions must be complete, accurate and in standardized format if the station is to be reliably and easily recovered for use in the future. Descriptions shall be in the standard NGS format of three paragraphs as described below under "Description Format."

1.0 GENERAL

1.1 DEFINITION OF DESCRIPTION VS. RECOVERY NOTE
  a. A *description* details the location of a new survey mark, or one not previously in the NGS digital database.
  b. A *recovery note* is an update and/or refinement to a description already in the NGS digital database, written upon a return visit to a survey mark.

1.2 LEVELS OF COMPLEXITY OF RECOVERY NOTES
  a. No Changes - If an existing station's digital description is complete, accurate, and meets Blue Book requirements, the station may be recovered with a brief recovery note, such as "RECOVERED AS DESCRIBED."

  b. Minor Changes - If minor changes or additions to the description are required, they may be added after the above phrase, such as "RECOVERED AS DESCRIBED, EXCEPT A NEW WOODEN FENCE IS NOW 3 METERS NORTH OF THE STATION." See typical cases listed below.

  c. Major Changes - Where major changes have occurred, major inaccuracies are found, or where required information is missing (in any portion of the description), a complete three-paragraph recovery note, with the same format as a new description, is required. If a measurement discrepancy is found, state that the new distance was verified, for example, by taping in both English units and metric units or by two separate measurements by two different people. See typical cases listed below.

  d. Exemption - If a recovery note has been written for the station within one year and no changes have taken place, a new recovery note is not required. Note, this may cause an error message in the description checking software, which may be ignored.

1.3 SOFTWARE - Descriptions and Recovery notes must be properly encoded into a D-file by using NGS WDDPROC software. Please refer to the NGS Web site: http://www.ngs.noaa.gov/FGCS/BlueBook/, Annex P (Geodetic Control Descriptive Data), for information. Note, WDDPROC is used for both new Descriptions and for Recovery Notes.

1.4 CHECKING - Descriptions shall be written by one person and checked by another. Recovery notes should also be checked. For example, a mark setter can draft a description immediately after setting the mark, and an observer can check the description during observations. For existing marks, the reconnaissance person can draft the recovery note and the observer can check it. Descriptions and Recovery Notes should be written while at the station or immediately after visiting a station so that all details are fresh in the writer's mind.

1.5 TYPICAL RECOVERY NOTE CASES
   a. A brief, one or two sentence Recovery Note is adequate:
        I. When the mark is found and the description is completely accurate, sample: ("RECOVERED AS DESCRIBED"),
        ii. When the mark is found and there are one or two minor changes, ("RECOVERED AS DESCRIBED EXCEPT A NEW WOODEN FENCE IS NOW 3 METERS NORTH OF THE STATION"),
        iii. When the mark is not found, ("MARK NOT FOUND AFTER 3 PERSON-HOUR SEARCH"),
        iv. When the mark is not found and presumed destroyed, (" MARK NOT FOUND AND PRESUMED DESTROYED. CONSTRUCTION FOREMAN STATES THAT THE MARK WAS DESTROYED YESTERDAY"),
        v. When the mark is found destroyed, (" THE MARK IS DESTROYED AND THE DISK HAS BEEN SENT TO NGS"or "THE MARK IS DESTROYED AND ITS PHOTOGRAPH HAS BEEN SENT TO NGS"). Note, for a station to be considered destroyed by NGS, the disk or photograph showing the destroyed mark must be received by NGS.

   b. A complete, new, three-paragraph Description/Recovery Note is required:
        I. When a new mark is set,
        ii. When an existing mark does not have a PID,
        iii. When an existing mark does not have an NSRS digital description (i.e., description is not in NGS database),
        iv. When an existing mark has only a brief description not meeting the three-paragraph requirement (many bench marks have only short, one-paragraph descriptions),
        v. When an existing mark's description is no longer accurate or complete.

2.0 DESCRIPTION FORMAT

The original USC&GS Special Publication No. 247, MANUAL OF GEODETIC TRIANGULATION, page 116, states, "A description must be clear, concise, and complete. It should enable one to go with certainty to the immediate vicinity of the mark, and by the measured distances to reference points and the description of the character of the mark, it should inform the searcher of the exact location of the mark and make its identification certain. It should include only essential details of a permanent character." NGS still follows these guidelines, so that a person with a minimal background in surveying and no local geographic or historical knowledge can easily find the mark by logically following the text of the description.

2.1 FIRST PARAGRAPH - The **first paragraph** is the *description of locality*. This part of the description begins by referring to the airline distance and direction (cardinal or inter-cardinal point of the compass) from the **three** nearest well-known mapped geographic feature(s), usually the nearest cities or towns. Use three references equally spaced around the horizon, if possible. **In writing the Description, always progress from the farthest to the nearest reference point**. Distances in this part of the description shall be in kilometers (followed by miles), or meters (followed by feet), all distances to one decimal place. Detailed measurements which appear elsewhere in the description should not be repeated in this paragraph. Points of the compass should be fully spelled out. Do not use bearings or azimuths. State the name, address, and phone number of public sector property owners (however, phone numbers of private property owners are NOT included). State any advance notice and security access requirements for reaching the station. Also state any unusual transportation methods that may be required to reach the station.

Sample first paragraph:

> "STATION IS LOCATED ABOUT 12.9 KM (8.0 MILES) SOUTHWEST OF EASTON, ABOUT 6.4 KM (4.0 MILES) NORTHWEST OF CAMBRIDGE, AND ABOUT 3.6 KM (2.2MILES) EAST OF SMITHVILLE ON PROPERTY OWNED BY MR. H.P. LAYTON, AND KNOWN AS OLD GOVERNOR JACKSONS ESTATE."

2.2 SECOND PARAGRAPH - The **second paragraph** contains the *directions **to reach** the station.* This section is one of the most useful parts of a description. It usually enables a stranger to go directly to a station without a delay due to a detailed study of maps or of making local inquiries. It is a route description which should start from a definite point, such as (a) the nearest intersection of named or numbered **main** highways (ideally Interstate and U.S. highways, or at least those which are shown on commonly used road maps), and approximately where that intersection is, or (b) some definite and well-known geographical feature (eg. main post office or county courthouse) and give its name and general location. Odometer distances shall be given to tenths of kilometers (followed by tenths of miles). For roads with names and numbers, give both in the first occurrence.

> a. The format for the first leg of the "to reach" is:
>> I. FROM THE MAIN POST OFFICE IN DOWNTOWN SMITHVILLE, or
>> I. FROM THE INTERSECTION OF INTERSTATE XX AND STATE HIGHWAY YY, ABOUT 3 MI NORTH OF SMITHVILLE,
>> ii. GO A DIRECTION (north, northeast, northerly, northeasterly, etc.),
>> iii. ON A ROAD (name or number of road or highway),
>> iv. FOR A DISTANCE (km followed by miles in parentheses),
>> v. TO SOMETHING (intersection, or fork in road, or T-road left or T-road right).

b. The format for all other legs:
>   I. TURN LEFT OR RIGHT, OR TAKE RIGHT OR LEFT FORK, OR CONTINUE STRAIGHT AHEAD,
>   ii. GO A DIRECTION (north, northeast, northerly, northeasterly, etc.),
>   iii. ON ROAD (name of road or highway),
>   iv. FOR A DISTANCE (km followed by miles in parentheses),
>   v. TO SOMETHING (intersection, or fork in road, or side-road left or right, or station on left or right).

All five parts of each leg shall be included in each "To Reach."

Sample:
>   "TO REACH THE STATION FROM THE INTERSECTION OF INTERSTATE 300 AND MAIN STREET (STATE HIGHWAY 101) IN JONESVILLE, GO EASTERLY ON HIGHWAY 101 FOR 3.7 KM (2.3 MILES) TO AN INTERSECTION. TURN RIGHT AND GO SOUTH ON MILLER ROAD FOR 5.1 KM (3.2 MILES) TO A SIDE-ROAD RIGHT. CONTINUE SOUTH ON MILLER ROAD FOR 6.6 KM (4.1 MILES) TO AN INTERSECTION. TURN LEFT AND GO EASTERLY ON SMITH ROAD FOR 2.4 KM (1.5 MILES) TO STATION ON THE LEFT IN THE FENCE LINE."

Use the word "EAST" if the road goes due east and "EASTERLY" if the road wanders in a general easterly direction. Use intermediate references, such as Miller Road above, if the distance becomes longer than about 5 miles. The place of the end of truck travel should be mentioned. If walking is required, note the approximate time required for packing. If travel to the station is by boat, the place of landing should be stated.

2.3 THIRD PARAGRAPH - The **third paragraph** provides *details of the mark and reference measurements.* It is made up of six parts: (a) the station mark type, (b) how the mark is stamped, (c) how the mark is set, (d) reference measurements, (e) the handheld GPS position, and (f) PACS or SACS designation, if appropriate. These sections are not numbered in the description, but shall be in the stated order with the stated information.

SECTION	EXAMPLE
(a) - State what the mark is:	THE MARK IS AN NGS HORIZONTAL DISK, OR A USC&GS TRIANGULATION DISK, OR A STAINLESS STEEL ROD, OR A CHISELED "X", ETC.),
(b) - State how the mark is stamped (in dashes):	STAMPED --JONES 1952--.
(c) - State how and in what the mark is set:	THE MARK IS SET IN A DRILL HOLE IN BEDROCK, OR SET IN A SQUARE CONCRETE MONUMENT, OR IS A ROD DRIVEN TO REFUSAL, ETC. A GREASE-FILLED SLEEVE ONE M LONG WAS INSTALLED.

The description shall specify whether the rod was driven to refusal or whether it met the slow driving rate (this is specified in Attachment G, part C-11 as 60 seconds per foot or 90 feet). Also state if a grease-filled sleeve was installed and its length. For a rod mark, the diameter of the stainless steel rod and the diameter of the PVC pipe with the aluminum cap should be in English units, and the length of the plastic sleeve should be given in metric units only.

- State if the mark projects above the ground, is flush, or is recessed and the amount, (for a rod mark state the above for both the rod and the logo cap):	MARK PROJECTS 15 CM (5 IN), OR MARK IS FLUSH WITH THE GROUND, OR MARK IS RECESSED 20 CM (8 IN); OR LOGO CAP IS FLUSH WITH THE GROUND AND TOP OF ROD IS 10 CM (3.9 IN) BELOW THE TOP OF THE LOGO CAP,
- State the depth of the mark, if known:	CONCRETE MONUMENT, 1.2 M (4 FT) DEEP, OR ROD DRIVEN TO REFUSAL AT 15 M (49 FT)
(d) - State reference distances and directions from three or more permanent objects in the mark's immediate vicinity (farthest to nearest):	IT IS 20.7 M (67.9 FT) SOUTHWEST OF POWER POLE #2345, 15.2 M (49.9 FT) WEST OF THE EDGE OF HIGHWAY 134, AND 3.4 M (11.1 FT) NORTH OF A FENCE LINE.

Examples of objects used as references: existing reference marks, witness posts, center lines of roads, edges of runways, ditches, power or telephone poles, or buildings. Start with the farthest distance. Horizontal distances should be used. If slope distances were measured, that fact should be stated in the paragraph. The distances shall be in meters (followed by English measurement units in parentheses, except as noted in (c) above), and the directions shall be cardinal and inter-cardinal directions, fully spelled out, such as "NORTH", "NORTHEAST", or "NORTH-NORTHEAST". Magnetic bearings from the reference objects are recommended to assist in future recoveries.

(e) Provide a handheld GPS position for all new marks, all proposed mark locations, for marks with scaled positions, and for any other marks without NGS published positions. Include the accuracy code of HH1 or HH2, depending on the type of receiver used. HH1 stands for Hand-Held accuracy code 1 (differentially corrected, hand-held GPS), and HH2 stands for Hand-Held accuracy code 2 (stand-alone, hand-held GPS), as follows:

Accuracy code 1 (HH1) = +/- 1-3 meters
        Accuracy code 2 (HH2) = +/- 10 meters

GPS Data Formats:

CODE	LATITUDE	LONGITUDE	SECOND PLACES
HH1	NDDMMSS.ss	WDDDMMSS.ss	(2 places of seconds)
HH2	NDDMMSS.s	WDDDMMSS.s	(1 place of seconds)

Use "N" or "S" for latitude and "W" or "E" for longitude. Use three digits for the degrees of longitude.

(f) If the station is a Primary or Secondary Airport   THIS STATION IS DESIGNATED
Control Station mark, the third paragraph shall end   AS A PRIMARY AIRPORT CONTROL
with the appropriate designation of Primary or   STATION.
Secondary Airport Control Station):

Sample for a rod mark:

"THE STATION IS THE TOP-CENTER OF A 9/16 INCH STAINLESS STEEL ROD DRIVEN TO
REFUSAL DEPTH OF 18M. THE LOGO CAP IS STAMPED --SMITH 2003--. THE LOGO CAP
IS MOUNTED ON A 5 IN DIAMETER PVC PIPE. A ONE M LONG GREASE-FILLED SLEEVE
WAS INSTALLED. LOGO CAP IS FLUSH WITH THE GROUND AND TOP OF ROD IS 10 CM
(3.9 IN) BELOW THE TOP OF THE LOGO CAP. THE MARK IS 32.4 METERS (101.74 FEET)
NORTHEAST OF NORTHEAST CORNER OF THE HOUSE, 16.62 METERS (54.5 FEET)
NORTH OF WATER PUMP ALONGSIDE OF HEDGE AROUND OLD FLOWER GARDEN,
AND 4 METERS (12.96 FEET) NORTH OF NORTHEAST CORNER OF HIGH HEDGE
ENCLOSING OLD FLOWER GARDEN. THE HH1 GPS IS: 304050.2N, 1201020.4W."

Sample for a concrete monument:

"THE STATION IS AN NGS HORIZONTAL DISK, STAMPED --JONES 2003-- SET IN A
ROUND CONCRETE MONUMENT 1.2 M (4 FT) DEEP AND 0.3 M (12 IN) IN DIAMETER. IT
IS SET FLUSH WITH THE GROUND. IT IS 32.4 METERS (101.74 FEET) NORTHEAST OF
NORTHEAST CORNER OF THE HOUSE, 16.62 METERS (54.5 FEET) NORTH OF WATER
PUMP ALONGSIDE OF HEDGE AROUND OLD FLOWER GARDEN, AND 4 METERS (12.96
FEET) NORTH OF NORTHEAST CORNER OF HIGH HEDGE ENCLOSING OLD FLOWER
GARDEN. THE HH1 GPS IS: 304050.2N, 1201020.4W."

3.0 IMPORTANT POINTS REGARDING DESCRIPTIONS

    3.1 NAMES - Use the station designation (name) and PID, exactly as listed in the NGS database, in all survey records. Do not add dates, agency acronyms, or other information to the name, nor the stamping. Note, frequently the stamping and the official station designation are not the same. For example, stampings include the year set, but designations generally do not.

    3.2 TERMINOLOGY - Correct NGS survey terminology shall be used in all station descriptions and reports (see GEODETIC GLOSSARY, NGS, 1986).

    3.3 DISTANCES - All measurements are assumed to be horizontal unless labeled "slope." Distances measured from a line (e.g., the center-line of a road or a fence line) are assumed to be measured perpendicular to that line. The origin of measurements at the junction of two roads is assumed to be the intersection of center-lines of both roads. Measurements are assumed to be from the center of an object (i.e. power pole) unless stated otherwise.

    3.4 REPAIR - Any work done to repair a mark shall be described completely in the updated recovery note. Note, a repair strengthens the mark but must not change its position. For example, adding concrete or epoxy around a disk where some is missing is a repair.

    3.5 REFERENCE MARK NAMES - Note, reference marks are abbreviated "RM x" in descriptions, but on "Reference Mark" disks they are stamped "NO. x".

    3.6 WCHKDESC - Run the digital D-file through the WCHKDESC program (field-level option), one of several programs within the WDDPROC Software Suite, to identify format and coding errors. This program is accessed by (a) running the WDDPROC program and (b) selecting the program, WCHKDESC, from the main menu.

    3.7 METRIC CONVERSION - Use 3.2808333333 feet equals one meter.

    3.8 ABBREVIATIONS - Meter = M, kilometer = KM, centimeter = CM, mile = MI, nautical mile = NM, feet = FT, inch = IN.

4.0 THE WDESC PROGRAM

The WDESC program, one of several programs within the WDDPROC Software Suite (available over the Web at http://www.ngs.noaa.gov/PC_PROD/DDPROC4.XX/ddproc.index.html), is used to encode descriptions and recovery notes in D-FILE format for the loading of these descriptions into the NGS database. The NGS Blue Book and the WDESC documentation contain information for properly encoding descriptions. Helpful information is contained in the following paragraphs.

When creating a description file, a backup file is automatically created. Every time a few descriptions are entered, it would be best if they are checked with WCHKDESC and the file corrected. The backup should be renamed **before** reopening the program or it will be overwritten. Always exit from the WDESC program from the pull-down File option Exit. It is recommended to save the description file as a new filename every time the program is exited; saving after each description is entered is also recommended.

Remember to enter "Y" into the satellite usage code field in the *Header Record* if the mark is suitable for GPS observations.

Set the *condition code* on the *Description Header* form as described in The Description Processing Handbook, Chapter 1, D-FILE Format (for Both Microsoft Windows 95/98/NT and UNIX): The Format of a Description File (D-FILE), which is available on the Web by downloading dformat.htm from Section 4 of the WDDPROC page (http://www.ngs.noaa.gov/PC_PROD/DDPROC4.XX/ddproc.index.html).

Three separate paragraphs are required in the descriptive text field since they make the description much easier to read. Therefore, when entering the text into the *Description Header* form using the WDESC program, separate each paragraph by pressing the [ENTER] key on the keyboard to add a blank line at the end of the first paragraph.

The FPR code is a field on the *Description Header* form in the WDESC program. Set the "FPR" field in the Description Header form to "F", "P", or "R", for Flush, Projected, or Recessed, respectively.   In the description, include the logo cap relationship to the ground surface (projecting above, flush with, or recessed below), and include the distance that the top of the rod is below the top of the logo cap. It is important to include information regarding the exact placement of the logo cap for future reference.

A list of the proper agency codes for the WDDPROC Software Suite can be found on the NGS Web site in WDDPROC ANNEX C (http://www.ngs.noaa.gov/FGCS/BlueBook/annexc/annexc.index.html). The agency code to be used for marks that are set by the National Geodetic Survey is NGS. The agency code for marks set by the USC&GS is CGS. Contractors shall use the code assigned to their company. If a contractor does not have a code, a request for one should be emailed to: Burt.Smith@noaa.gov.

5.0 MARK TYPES

      5.1 CONCRETE MARK - For a concrete mark set in accordance with the requirements of Attachment E (http://www.ngs.noaa.gov/AERO/aerospecs.htm#vol1) use a *setting code* **of "07"**. This classifies the station with a default *vertical stability code* of "C".

      5.2 ROD MARK GREATER THAN 4 METERS - For an NGS 3-D stainless steel rod mark driven to a depth of 4 meters or GREATER, use a *monumentation code* of "F" and a *setting code* of "59". This classifies the station with a default *vertical stability code* of "A". Note, if the standard one meter plastic sleeve is used, the vertical stability code must be downgraded to "B".

5.3 ROD MARKS LESS THAN 4 METERS ARE GENERALLY NOT ACCEPTABLE, see "Geodetic Bench Marks," page 27, Table 3.

5.4 DISK IN ROCK OUTCROP - For a disk that is set in solid rock outcrop, use a *monumentation code* of "DH" or "DD" and a *setting code* of "66". This classifies the station with a default *vertical stability code* of "B".

Check the listing of valid *monumentation codes* and *setting codes* in The Description Processing Handbook, Chapter 1, D-FILE Format (for Both Microsoft which is available on the Web in Annex P of the blue book (http://www.ngs.noaa.gov/FGCS/BlueBook/), for the proper codes to use for other types of marks.

Again, refer to the complete directions available at the Web site for using the NGS software package WDDPROC to write the required station descriptions, and be sure to check your final product with WCHKDESC.